REMARKS/ARGUMENTS

Reconsideration of the application is requested.

Claims 1-5 and 8-30 remain in the application. Claims 1 and 20 have been amended. Claims 6-7 have been cancelled.

In item 2 on pages 2-7 of the above-mentioned Office action, claims 1-5, 8-12, 15-18, 20, 23-26, and 28-30 have been rejected as being unpatentable over Chuang et al. (US Pat. No. 6,137,570) in view of the applicant's admitted prior art under 35 U.S.C. § 103(a).

In item 3 on pages 7-9 of the above-mentioned Office action, claims 6-7, 13-14, 19, 21, and 31 have been rejected as being unpatentable over Chuang et al. in view of the applicant's admitted prior art and further in view of Kallioniemi et al. ("Optical scatterometry of subwavelength diffraction gratings: neural-network approach," Applied Optics, vol. 37, No. 25, September 1, 1998, pp. 5830-5835) under 35 U.S.C. § 103(a).

In item 4 on pages 10-11 of the above-mentioned Office action, claims 22 and 27 have been rejected as being unpatentable over Chuang et al. in view of the applicant's admitted prior art

and further in view of McNeil et al. (US Pat. No. 5,703,692)

under 35 U.S.C. § 103(a).

The rejections have been noted and claims 1 and 20 have been

amended in an effort to even more clearly define the invention

of the instant application. Support for the changes is found

in original claims 6-7 as well as on page 42, lines 14-16 of

the specification.

Before discussing the prior art in detail, it is believed that

a brief review of the invention as claimed, would be helpful.

Claim 1 calls for, inter alia:

> if a similarity between the reference signatures and
> measured signature has been found in the comparison step,
> then performing the step of:
>
>> classifying parameters of the test specimen surface
>> based on the comparison results;
>
> or otherwise performing the steps of:
>
>> measuring individual structures of the test specimen
>> surface with a high resolution measuring device for
>> specifying a quality of the test specimen surface
>> and for providing a further reference signature; and
>>
>> adjusting the weighting of at least one of the fuzzy
>> logic and the neural network as a function of the
>> further reference signature;
>>
>> classifying parameters of the test specimen surface
>> based on the measurement of the individual
>> structures.

Claim 20 calls for, inter alia:

> a high-resolution measuring device for measuring
> individual structures of the test specimen surface for
> specifying a quality of the test specimen surface and for
> providing a further reference signature, the weighting of
> the at least one of the neural-network and the fuzzy
> logic being adjusted as a function of the further
> reference signature;
>
> said classification module classifying parameters of the
> test specimen surface based on the comparison results, if
> a similarity between the reference signatures and
> measured signature has been found in the comparison step,
> otherwise classifying parameters of the test specimen
> surface based on the measurement of the individual
> structures.

It is an object of the invention of the instant application to
assess the quality of structured layers on a surface using
diffraction measurement or scattered light measurement,
commonly known as scatterometry. In a first step, a plurality
of reference patterns are measured in order to provide
reference signatures of structured surfaces. A specified
quality of the reference signatures is used for training a
neural-network or a fuzzy logic. Next, diffraction images or
scattered light images provide a measured signature of a test
specimen. The neural network or the fuzzy logic is now used
to compare the measured signature with the reference
signatures in order to provide a comparison result.

If the test specimen surface exhibits structures similar to
one of the reference signatures, it is possible to classify

the parameters of the test specimen surface based on the

comparison result performed by the neural-network or a fuzzy

logic. If, however, the comparison fails, i.e. a comparison

result cannot be provided, the individual structures of the

test specimen surface are measured with a high-resolution

measuring device, e. g. a scanning electron microscope.

Instead of performing the comparison, a result is provided by

the measurement of the individual structures with the high-

resolution measuring device. In the next step, this result is

used to adjust a weighting of the fussy logic or the neural-

network as a function of the measurement result.

According to the invention of the instant application, it is

not necessary to reconstruct the individual structures of the

test specimen by using a calculation from the circuit layout.

In addition, it is not necessary that the neural-network or

the fuzzy logic provide a quantitative characterization of the

test specimen surface. The neural-network or the fuzzy logic

is only used to decide which of the reference patterns fits

best to the device under test. If, however, none of the

reference patterns fits the test specimen surface, a

conventional high-resolution apparatus is used to determine

the parameters. The result of this step is in turn forwarded

to the neural-network or the fuzzy logic in order to learn the
new signature.

Chuang et al. disclose a method and apparatus for using far
field scattered and diffracted light in order to determine
whether a collection of topological features on a surface
conforms to an expected condition or quality. The
determination is made by comparing the far field diffraction
of a surface under consideration of a corresponding
diffraction pattern, which is called base-line pattern. If
the base-line diffraction pattern and the measured far field
diffraction pattern vary by more than a prescribed amount, it
is inferred that the surface features are defective.

Kallioniemi et al. disclose a method for performing an
accurate quantitative characterization of the geometry of a
different grating, which is deduced from diffraction-pattern
data, by using a neural-network. With respect to page 5833
and further to Fig. 4, it is shown that the neural-network
provides output values, which quantify the grating parameters
that characterize the grating geometry.

According to the invention of the instant application, the
neural-network or the fuzzy logic are used to characterize the
measured structure with respect to reference patterns in order

to associate the parameters of the reference pattern, which

fits best to the measured structure, to the measured structure

itself.   If there is no such reference pattern that fits to

the measured structure, a further measurement with a

conventional high-resolution apparatus, e.g. a scanning

electron microscope, is performed.   Then the leaning

capacities of a neural-network or the fuzzy logic are used to

provide this information for subsequent measurements.

This concept of the invention of the instant application,

however, cannot be seen in Chuang et al. or Kallioniemi et al.

Chuang et al. simply want to evaluate a non-random topological

variation on the surface of a substrate using a rapid and non-

destructive technique.   As stated in column 2, lines 12-16,

Chuang et al. want to avoid the use of a scanning electron

microscope.   The inventive concept of the invention of the

instant application of using the scanning electron microscope

in cases where the comparison fails is not shown in Chuang et

al.

Kallioniemi et al. use a neural-network for an accurate

quantitative characterization, but fail to show that the

combination of a high-resolution apparatus with the learning

capability of the neural network improves the quantity of a

comparison step.

A person skilled in the art would not arrive at the invention of the instant application even if the references Chuang et al. and Kallioniemi et al. were combined. Both documents do not show the inventive concept the invention of the instant application of using a high-resolution apparatus when it is not possible to derive parameters from a comparison with the reference pattern. Advantageously, the invention of the instant application uses the leaning capability of the neural-network or fuzzy logic to store the newly gained data of the further reference pattern by adjusting a weighting of the neural-network or fuzzy logic.
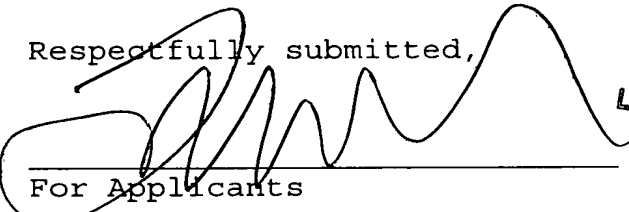
It is accordingly believed to be clear that none of the references, whether taken alone or in any combination, either show or suggest the features of claims 1 and 20. Claims 1 and 20 are, therefore, believed to be patentable over the art and since all of the dependent claims are ultimately dependent on claims 1 or 20, they are believed to be patentable as well.

In view of the foregoing, reconsideration and allowance of claims 1-5 and 8-30 are solicited.

In the event the Examiner should still find any of the claims

to be unpatentable, counsel would appreciate a telephone call

so that, if possible, patentable language can be worked out.

If an extension of time for this paper is required, petition

for extension is herewith made. Please charge any fees which

might be due with respect to 37 CFR Sections 1.16 and 1.17 to

the Deposit Account of Lerner and Greenberg, P.A., No. 12-

1099.

Respectfully submitted,

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For Applicants

YC

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